gist in charge of the anthracite division of the Second geological survey of Pennsylvania, are a very close approach to this theoretical perfection. They are devoted to the illustration of the Panther Creek coal-basin, the north-eastern portion of the southern anthracite field, included between the Little Schuylkill River on the west, and Mauch Chunk on the east. Of these charts, one sheet gives the reproduction of a topographical map of the basin, made by Mr. R. P. Rothwell in 1869, on a scale of 1,600 feet to the inch, with contour-lines at vertical intervals of 10 feet. Three sheets, forming but one map, show the shape of the floor of the mammoth coal-bed, on a scale of 800 feet to the inch. This is practically an underground map; and in it Mr. Ashburner has introduced the somewhat novel system of representing the shape of a certain bed in the basin by contours, in the same manner as the surface of the ground is represented in our grade-curve maps. These underground curves are printed in red, and are drawn at 50-feet vertical intervals; some of the prominent surface features, such as railroads and important buildings, being printed over them in black.

It seems a pity that Mr. Rothwell's map should not have been published on the same scale, so that it might be superposed upon the underground map; thus showing, at a glance, the difference between surface and underground topography. Such a map shows at once the shape of the basin, and, by the relative closeness of contour-lines, the angle of dip at any point; and from it may be constructed an actual section of the coal-basin on any given line. Twelve of such sections are actually constructed at favorable points, and represented on three other charts on a scale of 400 feet to the inch. They are also given on the same charts on a scale of 1,500 feet to the inch, drawn one under the other, so as to represent more graphically the general shape of the various folds, and the position of the underlying rocks. They are accompanied by a sketch-map of the whole basin on a scale of 2,300 feet to the inch.

On still three other sheets are given columnar sections, representing the thickness of the coal and intervening beds at a number of different points where they have been determined, constructed on various scales, from 10 feet to 300 feet to the inch. One of these sheets also contains a skeleton map of the basin, showing the locality of these sections as well as of the cross-sections.

Furnished with these maps, the mine-owner can tell at what distance a shaft or tunnel may reach the coal-bed from any given point, and the inclination of such bed when reached. He can determine the proximate line of the bottom of the various synclinal basins along which he wishes to run his galleries, and which coal from the various breasts may reach by gravity.

Of the three remaining sheets of the series, one gives a diagram showing, in different shades of color, the area of the respective coal-beds, developed on a horizontal plane; the second, a skeleton map of the entire anthracite region on a scale of $\frac{1}{300000}$, with columnar sections showing the local names of the various coal-beds in different parts of the region, and the names of all the collieries. The third sheet shows the production of anthracite coal, from its earliest development to the present day, both in columns of figures from different districts, and in curves forming a pyramidal diagram for the total product; also some brief historical notes.

The sheets are 26 by 32 inches in size, and are engraved by the reliable firm of Julius Bien & Co. They bear evidence of an immense amount of accurate detail-work; and the only serious criticism we have to make, is the use, by Mr. Ashburner, of the magnetic instead of the true meridian.

The practical value of such maps as these, where underground developments have been carried on to a sufficient extent to furnish data which will make their deductions trustworthy, must be evident to the most untechnical; and that it has been appreciated by the mine-owners of the anthracite region is proved, not only by the practical aid they lent to the work by furnishing all their surveys and measurements, but also by their contributions of money to help defray its expenses. They form a highly instructive lesson of the practical value of a properly conducted geological survey, and one to which the legislators of Massachusetts and Rhode Island would do well to turn a listening ear; for it is certainly a disgrace, in these enlightened times, that they have within the borders of their states a coal-basin of which less is known than of those of the wild, almost uninhabited, regions of the Rocky Mountains.

THE SMITHSONIAN PUBLICATIONS.

Catalogue of publications of the Smithsonian institution, 1846–82, with an alphabetical index of articles. By W. J. Rhees. Washington, *Smithsonian institution*, 1882. 14+328 p. 8°.

A preface states in a general way what the institution has published, the rules for distribu-

tion, and the prices of those numbers which are sold. A detailed chronological list of the 496 issues is then given, followed by a classified list under 29 heads, with some subdivisions, and, finally, by an alphabetical index to the Contributions, Miscellaneous collections and Reports of the Smithsonian, the Bulletins and Proceedings of the National museum, and the First annual report of the Bureau of ethnology. Thus every inquiry that will probably be made is answered beforehand. Is my set complete? Is this volume perfect? What articles are there in this department of science? In what volume or volumes has this man written? In what is this subject treated? How can I get them? How can I procure a set, or get the volumes as they are issued? Indeed, if one must be critical, we should say that answers are provided for some questions which only an idiot could be expected to ask. In the index, not only are references made from the names of the authors, and from the subjects of articles, but from the first words of their titles, however insignificant they may be. Thus we have such entries as *Contributions* to history of fresh-water algae, *Criticisms* of Dr. J. Hahn, *Hints* on public architecture, *Knowledge* of cryptogamous plants, *Means* of destroying the grasshopper, *Method* of preserving lepidoptera, *Narrative* of the Hassler expedition, and scores of others just as unworkmanlike as these, — entries that would make the Index society stare and gasp. In an ordinary book this might be overlooked; but it is unworthy of one which is intended to be one of the monuments of the scientific achievements of our country. It is true, these articles are all indexed in their proper places also; so that the fault is, at worst, one of surplusage. We have seen indexes in which entries were made under *A* and *The*, and there only. Mr. Rhees has not reached this length of absurdity. He may urge that there are people who will look for the articles under the words to which we have objected. It is difficult to over-estimate the mental left-handedness of mankind, but Mr. Rhees is addressing a scientific public. We should be sorry to believe that their training had produced no better habits of thought than he seems to anticipate.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Spectroscopic observations of the transit of Venus. — Tacchini at Rome observed the first and second contacts by means of the spectroscope, in the manner first proposed by Young in 1869. He saw the external contact 54 seconds earlier than his colleague Millosevisch, who observed with a telescope in the ordinary way: the second contact (internal) he observed 36 seconds earlier. A discussion shows that the spectroscopic observations are superior in accuracy to the telescopic. An attempt was made to observe the contacts at Palermo in the same way by Riccó, but it failed. At the moment when the planet left the chromosphere, and its atmosphere was on the slit of the spectroscope, both Tacchini and Riccó saw, for a fraction of a second, one or two bands between B and C, which could only have been caused by the planet's atmosphere. — (*Mem. spettr. Ital.*, Dec., 1882.) C. A. Y. [636

Observations of the lunar crater Plato. — A comparison by A. Stanley Williams of a large number of observations taken by himself and others in 1879–82 with a similar series taken in 1869–71 seems to give evidence of change in this crater. Of thirty-seven spots seen in the crater in 1869–71, six were not seen in 1879–82; while seven, not seen during the first period, were seen in the second. The mean visibilities of most of the spots observed in both series agree very closely, but eight show a decided variation in brilliancy. Among the light streaks in the crater, some change was noted, particularly in one which was not seen at all during the first twelve months of the first period, and is now larger and brighter than others previously seen. [This paper is to be continued.] — (*Observ.*, March 1.) M. MCN. [637

MATHEMATICS.

Transformation of surfaces. — Professor Enneper, in this article, has reproduced the substance of two previous articles which he has written upon the same subject, with a number of additions. The particular transformations treated of are defined as follows: the corresponding points P and P_1 of two surfaces S and S_1 are so related to a fixed point O, that the plane through the points O, P, and P_1 contains the normals to the surfaces S and S_1 in the points P and P_1. Among other derived surfaces coming under this head are the pedal and negative-pedal surfaces, inverse surfaces, etc. A generalization of Malus' theorem is given; viz., the surface separating two homogeneous media is regarded from a given point O; at a point P of the surface, the ratio of the sines of the incident and reflected rays is a function of the distance O P: the reflected rays are then the normals to a certain surface and its parallel. The author discusses the problem of finding when lines of curvature upon the given surface S correspond to lines of the same kind upon the derived surface S_1. The results in this case are tolerably well known. — (*Math. ann.*, xxi. 1883.) T. C. [638

Geodesic polygons. — The results obtained by the author, Otto Staude, in this paper, are for the most part known; but his method seems to be entirely new. M. Staude attempts, in a measure, to do for quadric surfaces, by aid of hyperelliptic functions, what has already been done for conics by the aid of elliptic